An Approach to Mobile Telecom Churn Handling in India
Sanjay Jamwal
Baba Ghulam Shah Badshah University,
sanjayjamwal_2k6@rediffmail.com

ABSTRACT
With a subscriber base of more than 650 million,[4] the Mobile telecommunications system in India is the second largest in the world and it was thrown open to private players in the 1990s. As the deregulation and great advance of new technologies, the competition in mobile telecommunication industry is getting severe. And Mobile number portability was given a go ahead on 25th Nov 2010 to add to the woes of Mobile Operators. Accordingly, churn prediction and management have become of great concern to the mobile operators. Mobile operators wish to retain their subscribers and satisfy their needs. Hence, they need to predict the possible churners and then utilize the limited resources to retain those customers. In response to the difficulty of churner prediction, this study applies data mining techniques to build a model for churner prediction. The study is referring to develop similar approach to support telecom churn management. Through an analysis result from telecom provider, the results indicated that the proposed approach has pretty good prediction accuracy by using customer demography, billing information, call detail records, and service changed log to build churn prediction model.

KEYWORDS
Mining Technology, Telecom Churn, Prediction, Model

1.INTRODUCTION
The problem of churn, or loss of a client to a competitor, is a problem facing almost every company in any given industry. This phenomenon is a major source of financial loss, because it is generally much more expensive to attract new customers than it is to retain and sell to existing ones. Therefore, churn is important to manage, especially in industries characterized by strong competition and saturated markets, such as the mobile telecom industry. The Indian telecommunications industry is the world’s fastest growing telecommunications industry,[1][2][3] with 706.37 Million telephone (landlines and mobile) subscribers and 652.40 Million mobile phone connections as of Aug2010 [4].The following table gives details regarding the subscriber base of each Mobile Service Provider in India as of 31 July 2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bharti Airtel</td>
<td>139,220,882</td>
<td>21.34%</td>
</tr>
<tr>
<td>MTNL</td>
<td>5,255,444</td>
<td>0.81%</td>
</tr>
<tr>
<td>BSNL</td>
<td>73,781,448</td>
<td>11.31%</td>
</tr>
<tr>
<td>Reliance Communications</td>
<td>113,315,831</td>
<td>17.37%</td>
</tr>
<tr>
<td>Aircel</td>
<td>43,296,659</td>
<td>6.64%</td>
</tr>
<tr>
<td>Sistema</td>
<td>5,582,683</td>
<td>0.86%</td>
</tr>
<tr>
<td>Loop</td>
<td>2,947,288</td>
<td>0.45%</td>
</tr>
<tr>
<td>Unitech</td>
<td>6,873,798</td>
<td>1.05%</td>
</tr>
<tr>
<td>Idea</td>
<td>70,748,936</td>
<td>10.84%</td>
</tr>
<tr>
<td>Eissalat</td>
<td>30,023</td>
<td>0.005%</td>
</tr>
<tr>
<td>Videocon</td>
<td>2,777,396</td>
<td>0.43%</td>
</tr>
<tr>
<td>Stel</td>
<td>1,423,043</td>
<td>0.22%</td>
</tr>
<tr>
<td>Tata Teleservices</td>
<td>74,850,220</td>
<td>11.47%</td>
</tr>
<tr>
<td>HFCL Infotel</td>
<td>851,887</td>
<td>0.13%</td>
</tr>
<tr>
<td>Vodafone</td>
<td>111,465,260</td>
<td>17.08%</td>
</tr>
<tr>
<td>All India</td>
<td>652,420,798</td>
<td>100%</td>
</tr>
</tbody>
</table>

In India, the mobile telecommunication market was opened to the private enterprises since 1990 [5]. At the initial stage, there were few mobile operators to get involved, like Bharti airtel, Reliance, Tata Ent., BSNL, Idea cellular etc. To keep the competitive advantages and acquire as many customers as possible, most operators invest a lot to expand the business in the very beginning. The competition is getting severe day by day inspite of large base customers in India. It means that how to keep good relationship with customers and remain competitive in such a tough campaign is really an important task to these operators. Undoubtedly, ‘Churn’ is a critical problem that is now harassing telecom companies in India. As Rob [17] noted: For many telecom executives, figuring out how to deal with Churn is turning out to be the key to very survival of their organizations. Therefore, in such a competitive environment within the service industries, retaining customers and maximizing profit from an existing customer base have become at least as important as attracting customers, surely telecom industry is not the exception. In order to share legacy systems loading and solve analytical reports requirements, most mobile telecommunication companies are turning to IT technologies to resolve some challenging issues. They built data warehouse not only to share legacy systems’ loading, but also to provide marketing/sales management team with analytical reports. However, most companies did not make the big use of this data warehouse system. They did not know how to apply it as a decision supporting system to come out with the best promotion strategies. Therefore, in the meantime how to
effectively use this huge database to catch marketing opportunity is a crucial issue for telecom companies.

1.1 MOTIVATION
As the estimation of marketing researchers, the average churn of mobile telecom industry is 2.2% per month. That is, about 27% of given carrier’s customers are lost each year. Thus, it is more essential to develop effective method to retain the existing customers for these companies, because the cost of acquiring a new customer is usually much higher than that of retaining an existing one [7]. We know the problem confronting mobile telecommunications’ management is that it is very difficult to determine which subscribers leave the company and why. It is therefore even more difficult to predict which customers are likely to leave the company, and more difficult still to devise cost-effective incentives that will convince likely “churners” to stay. Therefore, from the above description, we know the churn management is most critical issue in any telecom firm. Specifically, when CRM (customer relationship management) have been discussing more and more popularly in service industries, then how to manage customer churn is relatively important for telecom industry. Based on above-mentioned, this research try to use IT technology to assist the telecom churn management, particularly using data mining techniques to find a best model of predictive churn from data warehouse to prevent the customers turnover, further to promote their competitive advantage.

2. RESEARCH OBJECTIVES
For combating the high cost of churn and toward improving the customer’s relationship, increasingly sophisticated techniques can be employed to analyze why customers churn and which customers are most likely to churn in the future. Such information can be utilized by marketing departments to better target recruitment campaign and by active monitoring of customer call base to highlight customers who may, by the signature in their usage pattern, be thinking of migrating to another provider can utilize. As churn is such a massive problem that it affects other aspects of customer relationship management (CRM), such as customer acquisition. Mobile telecom operators have to think the following questions:

(1) Are the customers likely to churn before we have made a return on our investment?

(2) How is churn affecting the lifetime value of our customer base?

(3) Can we get a complete view of our customer information, so that we can profile likely churners?

Based on these questions, telecom operators also need to find a solution to reduce the churn rate, and to prevent the profitable customer switching to other competitors. But in the real world, it is a real difficult problem to all mobile operators, how to find the right customers to acquire? And how to retain the profitable customers to stay? All of these questions are the critical issues that are bothering these mobile operators. IT departments of telecom always tend to focus on meeting day-to-day operational goals, such as providing and maintaining the switching system needed to allow calls to take place, and the billing systems to charge for calls made. In many cases the technology is not in place to support the complex requests for information from the sales and marketing departments, who must address the issue of churn. Also, the organization may lack the expertise to support complex data mining and analytical tasks, which are essential in combating churn as well as in many other aspects of CRM. The volumes of data that are needed to undertake such tasks are huge and sometimes difficult or impossible to access and consolidate using conventional operational-system tools. Because of these, marketing department can only provide existing customers with a general promotion to retain them. But, in fact, this way also costs as much money as acquiring new customers. Even as we have noted, most of mobile companies have built their data warehouse, a data warehouse allows the relevant operational data to be stored separately from the transactional systems themselves, and organized according to units that make sense to marketing analysts (such as contract and customer). But at the present stage, they just only use the data warehouse generate the operational reports, management reports or few business analytical reports rather than using data warehouse to find the hidden valuable information to upgrade their marketing competition even though they have sensed that in the present competitive environment within the service industries, retaining customers and maximizing profit from an existing customer base have become a least as important as attracting customers. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large databases. Data mining for the telecommunication industry is an important application. The telecommunication industry has quickly evolved from offering plain old telephone services into providing many other comprehensive communication services including fax, e-mail, computer and web data transmission. The integration of telecommunication, computer network, Internet, and numerous other mean of communication and computing is also underway. Moreover, with the deregulation of the telecommunication industry in many countries and development of new computer and communication technologies, the telecommunication market is rapidly expanding and highly competitive. This creates a great demand for data mining in order to understand the business involved, identify telecommunication patterns, make better use of resources, and improve the quality of service. Likewise, data mining techniques can also bring powerful modeling analytics to the identification of the “Why” and “Most likely” groups. In order to analyze the customer attributions to manage the customers’ churn, this study will intend to base on the cause/reason/characters that was collected from reference review, and use data mining techniques to find a predictive model of voluntary churn, and hope it could identify the patterns that can precede customer churn.

3. REVIEW OF THE LITERATURE
Berson et al. [7] noted customer churn is a term used in the mobile telecom industry to denote the movement of mobile customers from one provider to another. Churn management is to describe the process of ensuring that profitable customers stay with a particular company. However, customer churn is a serve problem for mobile telecom operators, in the meantime to increase its services base while controlling customer churn is essential to survival and growth of a mobile telecom company. On the other hand, Kentritas (n.d.) thought that the term Churn Management in the telecommunications market is used to describe the procedure of securing the most important customers for a company. The proper customer management presupposes the ability to forecast the customer’s decision to move from one provider to another and the reception of proper measures in order to avoid the movement and retain their customers. As SAS institute investigated, Churn costs European and U.S. telecom close to US$4 billion each year, and the global cost of customer defection may well approach a staggering US$10 billion each year[18]. Annual churn rates of 25 to 30 percent are the norm, and carriers at the upper end of this spectrum will get no return on investment on new subscribers. Why? Because it typically takes three years to recover the cost (approximately US$400 in the United States and US$700 in Europe) of replacing each lost customer with a new one (customer acquisition). Particularly, in the European and Asian markets, the number of new market entrants is adding to the churn phenomenon. In Europe, 30 new telecoms entered the market in 1998, seeking the 15 percent marketing share that analysts say the will need to survive. The growth in the number of subscribers has eased this situation in the past, but as market growth slows and average revenue-per-user declines, increased competition is likely [18]. How serious of churn problem in telecom? Matterson [17] said Churn is expensive, not only is churn an inevitable part of doing business in mobile, it is also proving to be an extremely expensive experience. Churn has many consequences, and most of them carry a large price tag. The biggest consequences of churn are the loss of revenue, since lost customer is equal to lost revenue. Thearling [19] proposed that Data Mining is the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their huge database. Data mining tools can answer business questions that traditionally were too time consuming to solve. Miguel A.P.M. Lejeune (2001) addresses that Data Mining Techniques allow the transformation of raw data into business knowledge. The SAS institute [18] defines data mining as “the process of selecting, exploring and modeling large amount of data to uncover previously unknown data patterns for business advantage”. Consequently, we would say that data mining is applying data analysis and discovery algorithms to enumerate patterns over data for prediction and description. Recently, data mining has been generally applied to many industries on solving business problems. The empirical results shown that the response rate of the target marketing strategy supported by the proposed approach was more than tree times of that of the mass marketing strategy. Anand, Patricj, Hughes, and Bell [6] have identified the cross-sales problem and analyzed this problem from the view of solving it using data mining techniques. The data mining solution is based on the discovery of characteristic rules, generalized to allow uncertainty in the rules, from the set of positive examples. They discussed has been applied to a real world data mining application in the financial sectors and results of its application are also provided. Moreover, the author mentioned that the methodology was developed to provide a data mining solution to the cross-sales problem resulted in useful knowledge being discovered from the customer database, and it has great potential for exploitation within other service sectors. In recent years, CRM has been discussing extensively, especially in customer-oriented industries. They emphasize CRM more than other aspects. Hence, from the above references, churn management seems much important to telecom’s CRM, especially in the case of mobile market is getting saturated in India. Therefore, meanwhile, how to keep existing customers is quite important for these mobile providers. After finding out the churn’s predictive model, marketing department further needs to segment their customers, score customers, and to identify the profitable customers, retain the profitable ones who will likely to leave that has been predicted by using the predictive model. For all churn predictive models, customer segmentation and scoring can also be completed to use the data mining techniques. Such like Anand et al. [6] mentioned data mining techniques can be applied to discover the customers’ information for other service industries. Wei et al. [18] also addressed: data mining techniques can be developed for other telecommunication application. Consequently, this study is referring to these researches as a benchmark to develop similar approach to support telecom churn management. This research intends to base on these factors and concepts that addressed by above researchers to find a best predictive model for telecom churn management using data mining techniques.

4.METHODOLOGY
This study will base on this framework and apply telecom’s existing transaction data that is stored in data warehouse or legacy systems to find a churn predictive model. In this research, data mining techniques is selected to build predictive models and segment customer. We will introduce all procedures and related techniques that is used by this research.

(1) Data Collection
(2) Exploring data analysis (benchmark, reference review)
(3) Customer Experience Management

The commercial data mining tool Chordiant Predictive Analytics Director [20] was used for automated data preparation (attribute binning, grouping, recoding, selection) and modeling (logistic regression, decision trees).

In telecom industry, the size of database usually is very large. It is because there are so many legacy systems are operating to record all kinds of customers data, such like Billing system,
POS (point of sale) system, VAS (value-added service system), pre-paid system, provision system and MSC (Mobile Switch Center), etc. Among of these, the stored CDRs (call detail records) database is the biggest one, hence how to collect data and integrate these systems need IT technology to solve it. Building a data warehouse of data mart is the solution that has now been widely using in India telecom industry. Due to time issue and limitation of data obtained, in this research we only focus on using data mining techniques to build churn predictive model to support telecom churn management issue. As for others, they would also be other research subjects if someone where interested in.

5. DATA COLLECTION
A mobile telecom company in India provides this research with their customer related data. According the protection law of consumer, we cannot catch any original data source, therefore we are used the secondary data source included analysis results from company. The data source includes customer demography; Call Detail Records (CDR) and billing data of churner and non-churner from July 2009 to June 2010. Since such kind of data is sensitive and confidential, they randomly sampled the data around 15000 customers for this research that includes around 1205 churners.

6. EXPLORING DATA ANALYSIS
For the exploring data analysis, we got some possible variables from other researches or telecom experts’ analysis. We analyze these variables from four dimensions: customer demography analysis, bill and payment analysis, call detail records analysis, and customer care/service analysis.

6.1 CUSTOMER DEMOGRAPHY ANALYSIS
We got analytical result of the customer whose age between 45 and 48 their probability of churn is higher than population churn rate. And, the customers whose tenure between 25 and 30 months is highly possible to churn. The possible reason for this result is the contract expired, since most subscribers are required to sign a two-year contract with mobile operators. On the gender side, cooperators’ churn is higher than others. The customers who subscribe as cooperate accounts are the employees of some certain companies. Hence, when this group churner quit from these companies, they will deactivate mobile service. Unfortunately, the number of the subscribers of this group is too few to analyze.

6.2 BILL AND PAYMENT ANALYSIS
The customers whose monthly fee is less than 100 or between 520 and 550, the churn probability is higher. It seems that the subscribers who paid low monthly fee are easily to churn. If they subscribe this service mainly for free handset, after contract expired, the likelihood for them to deactivate this service is high. Those of the customers average billing amount of six months is not over 190 NT, their probability of churn is higher. The same as high monthly fee, low revenue subscribers aim for free handset at the beginning. Therefore, they probably do not use mobile service quite often.

6.3. CALL DETAIL RECORDS ANALYSIS
Customers whose monthly usage of outgoing calls are less than 28 minute, their churn probability is higher. To judge from the low usage, it seems that mobile service is not necessary to his group of subscribers.

6.4. CUSTOMER CARE/SERVICE ANALYSIS
The customers who ever changed their phone numbers or the number of changed count is greater than two, their churn probability is high. It seems that this kind of subscribers do not feel satisfied with the mobile operators. Hence, they decided to churn after they have changed their phone number many times. In general, customers who have ever been bared of suspended, the subscribers will be bared or suspended by the mobile operators due to their over-due payment.

7. CUSTOMER EXPERIENCE MANAGEMENT
Customer Experience Management (CEM) is the process of strategically managing and optimizing these experiences across all customer touch points and channels, in interactions that are either customer initiated or company driven, direct or intermediated [21,22]. CEM is closely related to its predecessor Customer Relationship Management (CRM). The distinction is somewhat artificial but one could argue that CRM focuses more on providing a 360 degrees view of the current relationship whereas CEM provides tools and methodologies to improve and extend the relationship by optimizing the overall customer experience. Churn management can be a key part of this. Churn models, in particular, can be important components of overall strategies that make these predictions actionable to drive intelligent interactions and experiences.

7.1 MEASURING CUSTOMER EXPERIENCE

![Customer Experience Diagram]

Aspect | Customer experience in mobile telecommunications
---|---
Brand | Usability
Usage | Support
Billing | Communication
Handset | Content
Peers | Network

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(Fig 1.) Framework for Mobile customers [23]

The framework contains two levels: Aspects and KPI. The Aspects level represents the various aspects of customer experience in mobile telecommunications. The KPIs level defines possible measurements for the different aspects of customer experience.

8. DISCUSSION OF EXPECTATIONS

Churn prediction and management is critical in broadly liberalized mobile communication market. In order to keep the competitive advantage in such a market, mobile service providers must be able to predict risky subscribers on whom the subsequent customers retention efforts is focused. In this research, we proposed data mining techniques to build predictive models for telecom churn management. We referred to the suggestion of the prior research of Wei et al. [18] to include the customer service and customer complain log for modelling, and furthermore telecom and we used adequate data of customer information that is much effective to build a robust predictive model for churn management, no matter what kind of data mining technique be used. The purpose of this research is to propose an approach to assist telecom churn management, and we know to use data mining technique can assist telecom churner prediction.

9. RESEARCH LIMITATIONS

As mentioned previously, data collection was extracted from data warehouse of a mobile service provider, and they only provided the analysis result of this study with sample around 15,000 subscribers of one-year data. For this reason, particularly the churn rate is low and the sample size of each segment was too small to result in an effective model after customers’ segmentation. It is the possible cause that the performance without segmentation model will much better than with segmentation one in this study.

SUGGESTIONS AND DIRECTION OF FUTURE RESEARCH

Any information feedback from customers is valuable, particular retention response. It is helpful to the service providers to calculate of retention strategy, and to know what kind of promotion is successful for customer retention. Therefore, using data mining to build a response descriptive model will be an interesting topic for further researches on telecom churn management. Additionally, data mining can be applied in many fields, such as banking credit card fraud detection and credit score. CRM is popularly discussed in service oriented industries nowadays to assist these companies, CRM will be a really interesting topic in the future.

REFERENCES

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